BRANCHING OUT
IPM NEWSLETTER FOR TREES & SHRUBS

Whatever Happened to Dogwood Anthracnose?

Margery Daughtrey, Department of Plant Pathology and Plant-Microbe Biology, Cornell University

History

Back in the late 1970s, unusual symptoms began appearing in our native dogwoods, *Cornus florida*, growing in the Northeast. The leaves were brown-spotted, or blighted entirely. Multiple watersprouts, or epicormic branches, erupted from the trunks of severely affected trees, which were described as having "lower branch dieback" because of leaf blight and dieback symptoms being most concentrated in the lower canopy. Landscape dogwoods were severely disfigured, and many died—especially those in shadier settings. After the disease was seen in the Northeast, it began to spread southward, reaching Georgia in 1987. The disease moved into the Midwest more slowly. A parallel problem assailed the western flowering dogwood, *Cornus nuttallii,* at the same time: a new disease killing leaves and twigs was reported in 1979 in the Pacific Northwest.

The Eastern flowering dogwood, Cornus florida, is a much-appreciated native tree. It is most readily seen along roadsides now, at the edge of woods, in areas where dogwood anthracnose has eliminated trees in the understory. © M. Daughtrey

Researchers determined that the same fungus was causing the disease of dogwoods on both coasts: an anthracnose fungus that was later named *Discula destructiva*. Although this organism appeared to be a newly introduced fungus, most of the features of this new disease were akin to what was known about other familiar anthracnose diseases—but there was an especially dramatic effect on dogwoods. Foliage lower in the canopy was more vulnerable to infection (hence "lower branch dieback") and trees in shadier settings fared worse than those in sunny sites.

Impact

Dogwood population and tree health monitoring studies have been done collaboratively at Catoctin Mountain Park in Maryland by the US Forest Service and the National Park Service for the past 29 years. These surveys showed that 33% of the trees had been killed by dogwood anthracnose in 1984, and 79% had been killed by 1988. The cumulative effect on the dogwood population has been

Spots and blight caused by Discula destructiva are common on the foliage of epicormic branches. © M. Daughtrey

Dogwood anthracnose causes brown leaf spots with purple rims, as well as blighting of the entire leaf. © M. Daughtrey.

Purple-rimmed leaf spots with yellow haloes on a seedling dogwood. © M. Daughtrey

staggering: from a live population of 276 dogwoods per acre in 1984, there were about 13 trees per acre in 2013. And the survivors are mostly along roads. The average diameter of surviving trees also has been increasing over time — an apparent direct effect of the marked decrease in numbers of surviving new seedlings.

With fewer surviving trees to become infected, the epiphytotic (the term for an epidemic for plants) is no longer progressing, but that's not to be taken as good news. And we're now seeing that there may have been long-lasting effects on *Cornus florida* at the Catoctin Mountain site that may also be occurring elsewhere. Those of us watching dogwood along roadsides and on manicured estates do not have a true sense for the devastation wrought on forest trees by dogwood anthracnose in the late 1970s through the 1980s. Because the species does not regenerate except in sunny locations, because seed supply was reduced as dogwoods were killed, and because deer will browse young dogwood seedlings, the composition of our eastern woodlands may have been permanently altered by the disease.

The composition of our eastern woodlands may have been permanently altered by the disease.

Dogwood anthracnose today is not causing effects as striking as those observed in the 1980s in New York. We continue to be able to isolate the pathogen from leaves and twigs of older dogwoods in semi-shaded sites in Riverhead each year, but widespread blighting has not been seen in NY for decades. The best guess is that the pathogen killed the most susceptible individuals with ease, leaving only a few trees with some poorly understood resistance in its wake. It's also possible that the pathogen itself may be less vigorous now than it was initially.

Solutions: Resistant Dogwoods

Nurseries responded to this new disease right away, back in the 1980s, by increasing their stock of *Cornus kousa*, the Korean or Japanese flowering dogwood, a species with considerable resistance to dogwood anthracnose. *Cornus florida*, on the other hand, began to be used less often as an ornamental, and when it was used it was placed in sunnier sites where it required careful mulching, irrigation, and protection from dogwood borer — but was safer from the anthracnose.

Fortunately, the *Cornus florida* population had within it some natural resistance to the disease.

Hybrid dogwoods developed by Elwin Orton at Rutgers University were soon marketed for their serendipitous resistance to dogwood anthracnose (these plants were from a breeding program that originally aimed to improve dogwood borer resistance). The Stellar series® introduced from Rutgers in the early 1990s (and now off-patent) brought anthracnose and powdery mildew resistance from crossing *C. florida* with *C. kousa* ('Aurora'®, 'Constellation'®, 'Stellar Pink'®, 'Celestial,'® 'Ruth Ellen'® and 'Stardust'®). More recently, Orton's Jersey Star® Series incorporates parentage of *C. kousa chinensis* and *C. nuttallii*, resulting in 'Venus'® and 'Starlight'®, while 'Saturn'® and 'Hyperion'® are additional *C. kousa* x *C. florida* hybrids. The *Cornus kousa* parentage in these Rutgers introductions provides some resistance to both anthracnose and powdery mildew.

Fortunately, the *Cornus florida* population had within it some natural resistance to the disease. The cultivar 'Appalachian Spring'® from the University of Tennessee was developed specifically for anthracnose resistance — from a tree showing natural resistance among thousands of others that had succumbed to the disease in Catoctin Mountain Park.

'Appalachian Spring' is one of the flowering dogwoods introduced from the University of Tennessee. It is resistant to powdery mildew, and often shows more than four bracts per flower head. Photo courtesy of Mark Windham.

Other new Tennessee flowering dogwood cultivars, 'Appalachian Joy,'® 'Jean's Appalachian Snow,'® 'Karen's Appalachian Blush'®, and 'Kay's Appalachian Mist,'® are resistant to powdery mildew. The powdery mildew affecting flowering dogwood, *Erysiphe pulchra*, although present on a Cornell herbarium specimen on an unspecified *Cornus* sp. collected in Pennsylvania in 1879, was not a problem on ornamental plantings of *C. florida* until it began to appear on flowering dogwood in the eastern United States in the mid 1990s. Often unrecognized on dogwood, powdery mildew causes growth reduction and a reddening or bronzing of affected leaves, sometimes but not always accompanied by obvious powdery mildew mycelium and sporulation on the terminal growth during the summer.

Powdery mildew (Erysiphe pulchra) on dogwood can cause reddening or bronzing of infected leaves. © M. Daughtrey

Future Prospects

The ideal flowering dogwood for eastern landscapes will have resistance to both anthracnose and powdery mildew. Factors that affect the forest *Cornus florida* populations (including drought, rainfall, storm events that bring down the overstory — and deer) are largely out of our control. The availability of hybrid and selected resistant dogwoods plus knowledge of site conditions that help dogwoods to naturally resist disease should allow us to enjoy thriving *Cornus* in our landscapes in the future.